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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte NAOMI NODA,
JUNICHI SUZUKI, and
TAKASHI HARADA

Appeal 2008-3634
Application 09/735,930
Technology Center 1700

Decided: December 24, 2008

Before CATHERINE Q. TIMM, JEFFREY T. SMITH, and
KAREN M. HASTINGS, *Administrative Patent Judges*.

Opinion for the Board filed by *Administrative Patent Judge* TIMM.

Opinion Dissenting filed by *Administrative Patent Judge* SMITH

TIMM, *Administrative Patent Judge*.

DECISION ON APPEAL

I. STATEMENT OF THE CASE

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's decision rejecting claims 12, 14, and 15. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

The invention relates to a catalyst body with a catalyst layer containing an alkali metal deposited on a honeycomb carrier (Claim 12). The catalyst is intended to be used as a NOx adsorption catalyst for purification of automobile exhaust gas (Spec. ¶ [0001]). Conventionally, NOx adsorption catalysts include a catalyst layer on a carrier and the catalyst layer contains alkali metals (Spec. ¶ [0002-0003]). However, these alkali metals react with the catalyst carrier thereby corroding it (Spec. ¶ [0003). To overcome the corrosion problem, Appellants add an "anchor substance," i.e., a substance "that reacts predominantly with said alkali metal when compared with main components of the honeycomb carrier" (Claim 12 (3); see also Spec. ¶ [0007]). Because the alkali metal reacts predominately with the anchor substance, its reaction with the carrier is suppressed and, deterioration of the carrier is suppressed (Spec. ¶ [0007]). Claim 12 is illustrative of the subject matter on appeal:

12. A catalyst body comprising

(1) a honeycomb carrier having at least one main component;

(2) a catalyst layer comprising

(a) an alkali metal,

(b) a heat-resistant inorganic oxide, and

(c) a noble metal loaded on the heat-resistant inorganic oxide, and

(3) an anchor substance present by being added separately as an anchor substance in the catalyst layer that reacts predominantly with said alkali metal when compared with main components of the honeycomb carrier and which is at least one member selected from the group consisting of B, Si, P, S, C1, V, Cr, Mn, Ga, Ge, As, Se, Zr, Mo, Sn, Sb, I and W, whereby any reaction between main components of the carrier and said alkali metal is suppressed and the deterioration of the carrier is suppressed.

The Examiner rejects claims 12, 14, and 15 under 35 U.S.C. § 103(a) as unpatentable over Chattha (US 5,922,295, issued Jul. 13, 1999 to Chattha et al.).

The Examiner finds that Chattha teaches a catalyst body including a compound having P and W, which the Examiner finds to be an anchor substance within the meaning of the claims, on a carrier (Ans. 3). The Examiner acknowledges that Chattha does not contemplate adding an alkali metal to the catalyst layer, but finds that Chattha "teaches this as an option-see column 1-2," (the Background of the Invention) and concludes that using the alkali metal, while acknowledging the detriments thereof, "is an obvious expedient as a tradeoff between performance and expense." (Ans. 3.)

Appellants request review of the Examiner's rejection contending that Chattha does not suggest the Appellants' catalyst body because Chattha teaches away from adding alkali metals to a catalyst layer also containing an anchor substance as claimed. According to Appellants, Chattha, in fact, replaces alkali metals with tungstophosphoric acid, Chattha does not include the claimed anchor substance that preferentially reacts with alkali metal to minimize reaction between alkali metal and a main component of the carrier, and Chattha does not recognize the problem of corrosion nor the solution Appellants discovered (Br. 5-7).

II. DISPOSITIVE ISSUE

The issue on appeal is: have Appellants established that the Examiner reversibly erred because Chattha does not suggest, but instead teaches away from, adding an alkali metal to a catalyst also containing an anchor substance in accordance with claim 12?

III. PRINCIPLES OF LAW

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1739 (2007). However, when the prior art teaches away from a combination, that combination is more likely to be nonobvious. *KSR*, 127 S. Ct. at 1740. The question to be asked is "whether the improvement is more than the predictable use of prior art elements according to their established functions." *Id.*

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994). But the degree of "teaching away" depends on the particular facts. *Id.* "Although a reference that teaches away is a significant factor to be considered in determining unobviousness, the nature of the teaching is highly relevant, and must be weighed in substance." *Id.*

IV. FINDINGS OF FACT

Chattha is directed to a nitrogen oxide trap for adsorbing nitrogen oxides in the exhaust gases of an internal combustion engine (col. 1, ll. 11-

15). According to Chattha, it was known in the art to use precious metals in combination with materials capable of storing or sorbing nitrogen oxides such as alkali metals and alkaline earth metals as lean-NOx traps (col. 1, ll. 40-53). But the alkali metals and alkaline earth metals typically used for NOx sorption have a serious drawback: they are readily poisoned by sulfur in the exhaust gas (col. 2, ll. 1-4). To avoid the sulfur poisoning problem, Chattha eliminates alkali metals and alkaline earth metals from the catalyst and forms the trap using a precious metal and tungstophosphoric acid loaded on a support (col. 1, ll. 16-17; Examples). Chattha discloses that by using the combination of precious metal and tungstophosphoric acid materials, the NOx conversion efficiency is maintained even in the presence of sulfur in the exhaust gas (col. 2, ll. 64-67). The active acidic sites of the acid specifically absorb NOx, but not the detrimental sulfur dioxide poison (col. 3, ll. 4-7).

V. ANALYSIS

There is no suggestion in Chattha of using both an alkali metal and an anchor substance in the NOx trap of that reference. Chattha, in fact, teaches away from such a combination. Including the alkali metal adsorbent in the precious metal/tungstophosphoric acid catalyst of Chattha would reintroduce the problem of sulfur poisoning into the NOx trap catalyst; a problem that Chattha explicitly teaches should be avoided. While the Examiner reasons that one would use alkali metal in the catalyst when the exhaust gases contain little or no sulfur (Ans. 3), the Examiner provides no evidence that for exhaust gas devoid of sulfur, there would be a reason to include the tungstophosphoric acid adsorbent.

Moreover, even if one where to assume, as our dissenting colleague does, that Chattha suggests combining alkali metals and tungstophorphoric acid (the "P and W" containing compound) for their known and predictable NOx adsorbing properties, sulfur poisoning notwithstanding, we cannot agree such a combination necessarily meets the requirements of claim 12. As pointed out by Appellants, Chattha does not suggest using the claimed anchor substance with alkali metals such that the anchor substance will have "the desirable effect of suppressing degradation of a catalyst carrier supporting such a catalyst/anchor substance combination." (Reply Br. 4 and para. bridging 5-6.)

Claim 12 is not just simply limited to the group of elements (including P and W) of the Markush group, one must select the member of the group in light of the particular carrier and particular alkali metal used. Only the Markush group member that "reacts predominantly with said alkali metal when compared to main components of the honeycomb carrier ... whereby any reaction between main components of the carrier and said alkali metal is suppressed and the deterioration of the carrier is suppressed" meets the requirements of the claim for a given carrier and alkali metal combination. According to the Specification, "[t]he kind of the anchor substance used differs depending upon the material of the carrier used," (Spec. ¶ [0008]).

The Examiner has not established that tungstophosphoric acid is an anchor substance that reacts predominately with the selected alkali metal when compared with the main components of the carrier as required by claim 12. Chattha selects tungstophosphoric acid for its NOx adsorbing properties. There is no recognition in the reference of a reaction with the carrier, nor does Chattha select the carrier with such a reaction in mind. The

Examiner provides no independent rationale or evidence indicating that tungstophosphoric acid, in fact, is an anchor substance within the meaning of the claims for the carriers of Chattha, or otherwise provides a basis in obviousness supporting the selection of tungstophosphoric acid and carrier such that the acid acts as a anchor substance.

Appellants established that the Examiner reversibly erred on the basis that Chattha does not suggest, but instead teaches away from, adding an alkali metal to a catalyst also containing an anchor substance.

VI. CONCLUSION

We do not sustain the Examiner's rejection of claims 12, 14, and 15 under 35 U.S.C. § 103(a) as unpatentable over Chattha.

VII. DECISION

The decision of the Examiner is reversed.

REVERSED

JEFFREY T. SMITH, *Administrative Patent Judge*, dissenting.

I respectfully dissent from the majority's view for the following reasons.

The issue on appeal is: have Appellants established that the Examiner reversibly erred in rejecting the appealed claims under § 103. The issue turns on whether it would have been obvious to a person of ordinary skill in the art to formulate a NOx adsorption catalyst utilizing a combination of known NOx adsorption components.

The invention relates to a catalyst body comprising a honeycomb carrier having deposited on a catalyst layer containing an alkali metal and at least one member selected from the group consisting of B, Si, P, S, C1, V, Cr, Mn, Ga, Ge, As, Se, Zr, Mo, Sn, Sb, I and W. (Claim 12). The Specification discloses that the catalyst is intended to be used as a NOx adsorption catalyst for purification of automobile exhaust gas (Spec. ¶ [0001]).

The Specification discloses that alkali metals such as K, Na, Li, and Cs are known NOx adsorption components used in NOx adsorption catalysts (Spec. ¶ [0002-0003]). The Specification discloses under high temperature conditions the alkali metal can react with the honeycomb carrier material (Spec. ¶ [0003]). The claimed invention attempts to prevent the reaction of the honeycomb carrier material with the alkali metal by adding a substance (anchor substance) capable of reacting with the alkali metal (i.e., B, Si, P, S, C1, V, Cr, Mn, Ga, Ge, As, Se, Zr, Mo, Sn, Sb, I and W). The Specification discloses that there is no restriction as to the form in which the anchor substance is added and the suitable components for the anchor substance can be added singly or in combination (Spec. ¶ [0010]).

Chattha discloses that alkali metals in combination with precious metals are known NOx adsorption components used in NOx adsorption catalysts (Chattha, col. 1, ll. 47-53). Chattha discloses P and W (tungstophosphoric acid) used in combination with a precious metal adsorbs NO at relatively low temperatures and that under high temperature conditions the NO is decomposed to N_2 (Chattha, col. 2, ll. 14-23). The Examiner properly concluded that it would have been obvious to a person of ordinary skill in the art to form the NOx adsorption catalysts of Chattha also further including alkali metals known NOx adsorption components (Ans. 3).

"Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1734 (2007) (citing 35 U.S.C. § 103 (a)). The legal question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) secondary considerations, if any. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 127 S. Ct. at 1734.

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR*, 127 S. Ct. at 1739. The question to be asked is "whether the improvement is more than the predictable use of prior art elements according to their established functions." *KSR*, 127 S. Ct. at 1740.

It has long been held obvious to combine two known materials for their known function. *In re Kerkhoven,* 626 F.2d at 850. As is evident from the present Specification and the Chattha reference discussed above, persons of ordinary skill in the art would recognize that alkali metals in combination with precious metals and P and W (tungstophosphoric acid) used in combination with a precious metal are known NOx adsorption components used in NOx adsorption catalysts. A person of ordinary skill in the art would have reasonably expected that alkali metals and tungstophosphoric acid used in combination with a precious metal would have been suitable for NOx adsorption catalysts.

Appellants argue that Chattha teaches away from the present invention. I do not agree. A person of ordinary skill in the art would have reasonably expected that alkali metals, P, and W used in combination with a precious metal would have been suitable for catalyst that provides some NOx adsorption. The presently claimed invention encompasses NOx adsorption catalysts comprising alkali metals and P and W used in combination with a precious metal and any amounts. The presently claimed invention does not define specific limits on the NOx adsorption that is achieved by the claimed catalyst composition. Appellants have not pointed to evidence on the present record that establishes the results obtained are different than those that are discussed in the prior art. Specifically, Appellants do not address the problem of sulfur poisoning discussed in the background section of the Chattha reference. In the absence of such evidence it appears that Appellants have accepted the potential deficiency discussed the by the Examiner (Ans. 3).

The majority, in agreement with Appellants asserts that Chattha does not suggest using the claimed anchor substance that will have the effect of suppressing degradation of a catalyst. (*slip op* 6). Contrary to the position taken by the majority, the Supreme Court of the United States rejected such a rigorous and inflexible approach (of requiring a suggestion in the cited reference) by stating that an obviousness "analysis need not seek out precise teachings directed to the specific subject matter of the challenged claim, for a court can take account of the inferences and creative steps that a person of ordinary skill in the art would employ." *KSR*, 127 S. Ct. at 1741. A person of ordinary skill in the art would have reasonably expected that alkali metals and tungstophosphoric acid used in combination with a precious metal would have been suitable for NOx adsorption catalysts.

Given the above teachings, I agree with the Examiner that one of ordinary skill in the art would have been led to form a NOx adsorption catalyst comprising alkali metals, P, and W in combination with a precious metal. *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. at 1740 (*quoting Sakraida v. Ag Pro, Inc.*, 425 U.S. 273, 282 (1976)) ("[W]hen a patent 'simply arranges old elements with each performing the same function it had been known to perform and yields no more than one would expect from such an arrangement, the combination is obvious.").

Accordingly, I would affirm the Examiner's decision rejecting the claims on appeal under 35 U.S.C. § 103(a).

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